AMENDMENTS TO THE SPECIFICATION:

Please amend the paragraph beginning at page 1, line 8, as follows:

FIELD ~~OF THE INVENTION~~

The ~~present invention~~described technology relates to a method and an arrangement in a mobile telephone network. In particular, it relates a method and an arrangement for transport network layer (TNL) control signaling in a Universal Mobile Telephony System Terrestrial Radio Access Network (UTRAN).

Please amend the paragraph beginning at page 3, line 10, as follows:

Resource Management in DiffServ (RMD) method, described in L. Westberg et al.: "Resource Management in DiffServ Framework", Internet Draft, Work in Progress, 2001; L. Westberg et al.: "Resource Management in DiffServ (RMD): A Functionality and Performance Behavior Overview", Protocols for High Speed Networks, 2002, Berlin may be used for dynamic resource management in IP networks. In RMD, resource management is done in two scales: per flow reservation is done in edge node while per traffic class reservation, or measurement based reservation is done in edge nodes. ~~The mayor~~ A major advantage of RMD ~~comparing~~ compared to IntServ based reservation methods is its scalability and lightweight protocol implementation in interior nodes.

Please amend the paragraph beginning at page 4, line 27, as follows:

To allow dynamic setup of ATM VCs, an ATM signalling protocol is needed, which is independent of Q.AAL2 signalling used for establishing user connections. As VCs configuration changes rarely, it is not worth the cost to

implement a separate signalling protocol for this purpose. Therefore, ATM layer VCs and VPs are typically configured manually via the management system.

Please amend the paragraphs beginning at page 5, line 15 through page 6, line 1, as follows:

SUMMARY ~~OF THE INVENTION~~

Thus, an object of the ~~present invention~~described technology is to provide an improved transport network control signalling that overcomes the above-mentioned drawbacks.

~~That is achieved by a method according to claim 1 and an arrangement according to claim 19.~~

~~Preferred embodiments of the invention are defined by the dependent claims.~~

Advantages ~~with the present invention are~~ include the following:

The embodiment(s) of the present invention ~~makes it~~ make possible to use standard IP based routing and management, which allows more auto-configuration and more flexible fault handling. By using RSVP-TE extended with RMD objects, it is possible to perform DiffServ based resource reservation.

The ~~present invention is~~ embodiment(s) can also adapted for bi-directional signalling and soft reservation states may be used which results in simpler signalling and more robust design.

Introduction of RSVP-TE based signalling offers smaller migration steps from ATM to IP. As a first migration step, Control Plane may be changed to IP

based RSVP-TE, requiring only software update in RNC and Node B. Then User Plane can be changed to IP starting from HRAN. Future Link Layer technologies, such as Ethernet, MPLS, optical switching, may also be adopted to UTRAN more easily. Thus, the RSVP-TE based signalling solution may be used to control AAL2/ATM TNL in UTRAN. The signalling solution ~~according to the present invention~~ may also be used to control mixed AAL2/ATM and IP based TNL in UTRAN, therefore no inter-working function or very lightweight inter-working function in TNL is required in the mixed IP-ATM based UTRAN.

Please amend the paragraph beginning at page 6, line 14, as follows:

Another advantage ~~with the solution according to the present invention~~ is that it is possible to perform dynamic configuration of the ATM layer while in the prior art solution with Q.AAL2 and the management system, permanent VCs and VPs are used.

Please amend the paragraph beginning at page 6, line 30, as follows:

FIG. 1 illustrates schematically a UTRAN wherein the embodiment(s) of the present invention may be implemented.

Please amend the paragraph beginning at page 7, line 21, as follows:

DETAILED DESCRIPTION ~~OF PREFERRED EMBODIMENTS OF THE PRESENT INVENTION~~

Please amend the paragraphs beginning at page 8, lines 1-24, as follows:

The Transport Network Layer (TNL) signalling solution ~~according to the present invention is~~ can be adapted for implementation in a UMTS Terrestrial Radio Access Network (UTRAN) TNL. The UTRAN comprises at least one RNC connected to at least one Node B via the TNL as described above. The TNL signalling ~~according the present invention is~~ can be based on the standard IP resource reservation-traffic engineering protocol, RSVP-TE, which is ~~the~~ an extension of RSVP to support label switched tunnels described in R. Braden et. al.: Resource ReSerVation Protocol (RSVP)--Version 1 Functional Specification, RFC 2205, September 1997; D. Awduche: Extensions to RSVP for LSP Tunnels, RFC 3209, December 2001. RSVP-TE signalling is performed each flow connection and standard RSVP-TE messages and objects are used.

One of the functionalities required by the TNL signalling is flow identification. For each connection, TNL signalling messages ~~has to contain~~ includes the flow identification information. In accordance with the current RSVP-TE messages standard SESSION object carries Node B IP address, UDP port number and protocol ID. SENDER_TEMPLATE includes RNC IP address and UDP port number. In this way SESSION and SENDER_TEMPLATE are the objects that contain the IP-based 5-tuple flow information. That identity is ~~in accordance with the present invention~~ used for flow identification in the TNL signalling in a UTRAN. SESSION and SENDER_TEMPLATE information is processed by the edge nodes such as the Node B or the IWU, but not in interior nodes.

Thus, one or more aspects of the present invention relates to a method and an arrangement for controlling the user plane of a UMTS Terrestrial Radio Access Network, UTRAN, comprising a first edge node connected via a Transport Network Layer to a second edge node, by using Transport Network Layer, TNL, signalling wherein a radio link is set up by using the Node B Application Part between the first and second edge nodes of the UTRAN, RSVP-TE based TNL signalling messages are transmitted between said first and second edge nodes for each TNL flow, and each TNL flow is identified by using RSVP-TE messages, wherein the object SESSION and SENDER_TEMPLATE comprises an IP based 5-tuple flow information, which is used as a TNL flow identity.

Please amend the paragraph beginning at page 9, line 19, as follows:

Referring to FIGS. 3a and 3b, the radio link connections are set up by Node B Application Part (NBAP) signaling between the RNC and the Node B in ~~accordance with prior art~~ a conventional manner. The setup is initiated at the RNC that sends a Radio Link Setup Request. The request is answered by the Node B in a Radio Link Setup Response message. In the NBAP signalling, the IP addresses and the UDP port number are exchanged, as shown in FIGS. 3a and 3b. Optionally, a DiffServ Code Point (DSCP) may also be transmitted.

Bi-directional resource reservation is established by the ~~TLN~~ TNL messages, the two-pass PATH message and the two-pass RESV message, as

shown in the FIGS. 3a and 3b. Two functionalities that the TNL signalling ~~have to provide is~~ provides are flow definition and resource reservation.

The flow identification is performed as described above ~~according to the present invention~~. In addition PDR objects contain the flow identity as described above, which is a combination of the source and destination edge node IP addresses and the DSCP field.

The message sequences to establish a bi-directional connection are shown in FIGS. 3a and 3b. In the RMD domain, the messages are routed by standard routing protocols both upstream and downstream. Unlike to standard RSVP and RSVP-TE concepts, per hop routing states are not stored in the routers in the RMD domain. RSVP-TE messages arranged to contain standard RSVP-TE objects and two objects i.e. PHR and PDR which are further described below, are in accordance with the first embodiment introduced in order to perform resource reservation in accordance with the "Resource Management in DiffServ" (RMD) method. The resource reservation is ~~required~~ desirable in order to provide QoS. The PHR and the PDR objects are defined in the RMD concept disclosed in L. Westberg et al.: "Resource Management in DiffServ Framework", Internet Draft, Work in Progress, 2001; L. Westberg et al.: "Resource Management in DiffServ (RMD): A Functionality and Performance Behavior Overview", Protocols for High Speed Networks, 2002, Berlin.

The resource reservation scheme of the first embodiment ~~of the present invention~~ is based on the RMD framework. In RMD, only the edge nodes, such as RNC and IWU as in the mixed IP and ATM/AAL2 network as shown in FIG.

3b, use complex reservation methods and maintain per flow resource reservation states. In interior nodes such as IP routers as indicated in FIGS. 3a and 3b, it is suitable to use only very simple resource reservation methods, e.g. summing resource units and it is suitable to maintain only aggregated reservation states.

Please amend the paragraph beginning at page 12, line 15, as follows:

According to a second embodiment of the present invention, the TNL signalling comprises an extension of RSVP-TE to be used in the ATM/AAL2 domain of the UTRAN. I.e., it is possible to use one single control protocol regardless of the transport technology, i.e. IP and/or ATM/AAL2. Therefore, in a network in which mixed AAL2/ATM and IP transport solutions are used, the IWU is not required in the TNL Control Plane between the ATM/AAL2 network and the IP network. However, the TNL signalling in accordance with the second embodiment ~~requires~~ includes additional objects in addition to the current RSVP-TE and also in addition to the TNL signalling in accordance with the first embodiment ~~of the invention~~. These additional objects ~~must however~~ should be excluded in the IP domain to ensure proper operation. To enable the application of AAL2 admission control functions used in one of the releases of UTRAN, the TNL signalling also comprises a possible usage of already existing objects of RSVP-TE.

Please amend the paragraphs beginning at page 13, lines 9-26, as follows:

The model of the UTRAN between an RNC and a Node B and a basic unidirectional signalling operation are shown in FIG. 4a in the network part between the RNC and ALL2 switch, indicated in FIG. 4a, the ATM network layer is semi-permanent while the other part (between AAL2 switch and Node B) it is set up dynamically on-demand. ~~(Could you explain this further. I don't understand the figure with the arrows.)~~ This means that between RNC and AAL2 switch only the AAL2 layer is controlled by RSVP-TE signalling (ATM layer is controlled by e. g. network management system), while between AAL2 SW and Node B both AAL2 and ATM are controlled by RSVP-TE. This is indicated in FIGS. 4a and b by PATH(AAL2) vs PATH(ATM, AAL2), etc. This is further explained in the next paragraph. In the semi-permanent part CBR, VBR or UBR.sup.+ VCs can be used, while in the dynamic part UBR.sup.+ VCs are considered.

The radio link connections are conventionally set up ~~according to prior art~~ by NBAP signalling between the RNC and the Node B as in the first embodiment of the invention.

RSVP-TE signalling ~~is according to the present invention~~ can be performed for each AAL2 connection. To distinguish the protocol functionality and protocol messages in different parts of the network, the protocol messages are denoted by RSVP-TE(AAL2) in the ATM/AAL2 part in which ATM VCs are

set up (semi-)permanently, and RSVP-TE(ATM,AAL2) in the ATM/AAL2 part in which both ATM and AAL2 layers are set up dynamically.

Please amend the paragraphs beginning at page 14, lines 14-16, as follows:

The flow identification of control messages is performed as described above~~ in accordance with the present invention~~.

In order to configure the ATM/AAL2 network part, CID, VPI/VCI values ~~have to~~ should be signalled between adjacent nodes along the path of the AAL2 connection. To achieve this, a LABEL_REQUEST with ATM Label Range (standard RFC 3209) is sent to the next ATM/AAL2 switch, which can choose a label from this range to be used on the specific link. For AAL2 configuration, a new class type must be defined, which in accordance with the second embodiment of the present invention is denoted AAL2_LABEL_REQUEST. AAL2_LABEL_REQUEST is sent in the PATH message to the next AAL2 switch indicating the AAL2 label range (i.e. CID range), from which the next hop AAL2 switch can select a single value. The form of this defined object is disclosed in FIG. 6.

Please amend the paragraph beginning at page 15, line 22, as follows:

In ~~he~~ the ATM/AAL2 network part, QoS is ensured by AAL2 CAC. One of the objects of the second embodiment is to minimize new implementation in the ATM/AAL2 nodes, e.g. to avoid the development of a new CAC algorithm.

The AAL2 CAC algorithm in one release of UTRAN, AAL2 switches has the following parameters: number of sources, link capacity, packet size, Transmission Time Interval (TTI), activity factor, QoS class, delay and loss requirement, segment size and priority level. From these parameters only packet size, TTI, activity factor, QoS class and priority level is signalled by Q.AAL2 in the prior art. The other parameters are either configured (e.g. link capacity) or measured (e.g. number of sources).

Please amend the paragraphs beginning at page 16, line 14 through page 17, line 13, as follows:

The DCLASS object contains DSCP of the flow. Assuming that the DSCP is exchanged in the NBAP signalling, which means that the Node B is able to put the proper value into the RESV messages. FLOW_SPEC and DCLASS are supposed to be used by AAL2 CAC for admission control decision. CAC parameters signalled in FLOW_SPEC object are packet size (bucket size) and TTI (bucket size/token rate). Priority level and QoS class is signalled in the DCLASS object. Thus, the only remaining CAC parameter that is signalled by Q.AAL2 but not mapped to RSVP-TE yet is activity factor. Activity factor cannot be obtained from standard IntServ token bucket parameters. This may be performed according to an embodiment of the invention in three ways. Firstly, the Activity factor values are configured in the AAL2/ATM nodes and DSCP and other traffic descriptors are used for classification. Secondly, it is signalled in one of the unused field of TSPEC and FLOW_SPEC, and finally a new field or

object are defined to signal the value of the Activity factor. However, the Activity factor may also be obtained by another method, which is obvious for a man skilled in the art.

An example of a successful establishment of a bi-directional connection is disclosed below. Unsuccessful Setup, Refresh, Tear Down operations are also based on standard RSVP-TE features and may be derived from the following example. ~~When assuming~~ It is assumed that asymmetric routing can occur, which means that the route of the UpLink (UL) and the DownLink (DL) traffic may be different. This requires the two-pass PATH message flow and the two-pass RESV message flow, as it is shown in FIG. 4b. The RESV message for the DL flow may be sent the same time as the PATH message for the UL flow. Note that this bidirectional reservation is made up from two independent uni-directional reservations. Therefore, the flow identifiers of the two directions are different and the assigned labels of the two directions on the same link may also differ.

In the table in FIG. 5, ~~the most important~~ one or more objects sent in PATH and RESV messages are described. The table also indicates which nodes read and which ones write the listed objects. In the case of the UTRAN, one problem is for the Node B to fill in the objects for the uplink reservation (i.e. SENDER_TEMPLAT, SESSION, SENDER_TSPEC). Accordingly, the Node B ~~must fill~~ fills in the objects SENDER_TEMPLATE and SESSION for the PATH message that ~~belongs~~ belong to the uplink reservation. A solution is according to the second embodiment of the present invention that the IP address and the

port are copied from the SENDER_TEMPLATE of PATH(DL) to the SESSION object of PATH(UL) and the IP address and port from the SESSION object of PATH(DL) are copied to SENDER_TEMPLATE of PATH(UL).

Please amend the paragraph beginning at page 18, line 1, as follows:

The objects LABEL_REQUEST and the object LABEL with AAL2 label range are defined according to the second embodiment of the present invention. ~~Said~~ The objects are defined in a similar way as LABEL_REQUEST and LABEL objects with ATM label range described in RFC 3209 [D. Awduche: Extensions to RSVP for LSP Tunnels, RFC 3209, December 2001]. The ~~less~~ least significant 8 bits ~~contain~~ include Channel Identification (CID) value, as shown in FIG. 6.

Please amend the paragraphs beginning at page 18, lines 15-26, as follows:

~~The~~ One method according to the present invention is illustrated by the flowchart in FIG. 7. Thus, the method for controlling the user plane of a UMTS Terrestrial Radio Access Network, UTRAN, comprising a first edge node connected via a Transport Network Layer to a second edge node, by using Transport Network Layer, TNL, signalling, comprises the steps of:

701. Transmitting RSVP-TE based TNL signalling messages between ~~said~~ the first and second edge nodes for each TNL flow,

702. Identifying each TNL flow by using RSVP-TE messages, wherein the object SESSION and SENDER_TEMPLATE comprises an IP based 5-tuple flow information, which is adapted to be used as a TNL flow identity.

Furthermore, the arrangement ~~according to the present invention comprises~~ includes means for performing the method of the present invention and the preferred embodiments. ~~Said~~ The means may be implemented by software and/or hardware means in a RNC, Node B and/or in an IWU.